

LISTING OF CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application.

Claims 1-8 (Canceled).

9. (Withdrawn) A product-manufacture-estimation method comprising:
extracting an estimation element necessary to determine manufacturing steps;
setting the steps of manufacturing a product on the basis of the estimation element;
estimating costs required for each step;
multiplying the estimated costs by a process rate, and adding a material cost to the multiplication result, thereby calculating a whole cost;
estimating and analyzing a rate-determining factor on the basis of the estimated costs and whole cost; and
executing a cost simulation by varying the processing step, analyzing a degree of influence upon the whole cost, and assisting the designing of the manufacturing steps.

10. (Withdrawn) The cost estimation method according to claim 9, wherein the step of estimating the costs includes:

creating a first source program configured to extract the estimation element from the estimation formula, and to convert the estimation element into a format which can be executed by a preinstalled programming rule;

creating a second source program configured to extract, from the estimation formula, the estimation element included in a physical unit table, to convert the estimation element

into the format which can be executed by the preinstalled programming rule, and to extract the physical unit value from the physical unit table;

converting the estimation formula into the format which can be executed by the preinstalled programming rule, on the basis of the first and second source programs.

11. (Withdrawn) A product-manufacture-estimation apparatus comprising:

an estimation element database which stores an estimation element necessary to determine a manufacturing process from a three-dimensional product CAD model;

an estimation reference database which stores a cost physical unit value used in each step of the manufacturing process, and an estimation formula expressed at least by a four-rule calculation rule;

a process setup reference database which prestores reference data for process setup;

a process-rate/material-cost database which prestores a material unit price, a purchase unit price and a process rate;

an estimation-element-extracting section which extracts the estimation element from the estimation element database;

a process setup section which searches the process setup reference database on the basis of the estimation element extracted by the estimation-element-extracting section, thereby setting the manufacturing process;

a source-program-creating section configured to create a source program, the source program automatically converting the estimation formula, stored in the estimation element reference database, into a format which can be executed by a preinstalled programming rule;

a cost-estimating section configured to obtain costs of said each step set in the process setup section by substituting the physical unit value extracted from a physical unit table, in the estimation formula converted by the source-program-creating section;

a cost estimating section which multiplies the costs estimated by the cost-estimating section, by the process rate stored in the process-rate/material-cost database, and adds a material cost, based on the material unit price, to the multiplication result, thereby calculating a whole cost;

a cost analyzing section which estimates and analyzes a rate-determining factor on the basis of the costs estimated by the cost-estimating section, and the whole cost calculated by the cost estimating section; and

a cost simulation section which executes a cost simulation by varying the processing step, analyzing a degree of influence upon the whole cost, and assisting the designing of the manufacturing process.

12. (Withdrawn) The product-manufacturing estimation apparatus according to claim 11, wherein the source-program-creating section includes:

a first source-program-creating section which creates a first source program configured to extract the estimation element from the estimation formula, and to convert the estimation element into a format which can be executed by the preinstalled programming rule;

a second source-program-creating section which creates a second source program configured to extract, from the estimation formula, the estimation element included in the physical unit table, to convert the estimation element into the format which can be executed

by the preinstalled programming rule, and to extract the physical unit value from the physical unit table; and

a third source-program-creating section which converts, on the basis of the first and second source programs created by the first and second source program-creating sections, the estimation formula into the format which can be executed by the preinstalled programming rule.

13. (Withdrawn) The product-manufacturing estimation apparatus according to claim 11, wherein the estimation-element-extracting section supplements another estimation element in accordance with an input operation of an operator, if the estimation element extracted from the three-dimensional CAD model is insufficient to specify the manufacturing process.

14. (Withdrawn) The product-manufacturing estimation apparatus according to claim 11, further comprising a three-dimensional CAD which creates the three-dimensional CAD model, and wherein the cost analyzing section provides the three-dimensional CAD with a factor that inhibits a cost reduction, or a design improvement factor for facilitating processing, the factors serving as feedback information.

Claims 15-17 (Canceled).

18. (Currently Amended) A product manufacturing cost-estimation apparatus comprising:

a three-dimensional CAD unit that creates three-dimensional CAD model data of a product and adds attribute information to the three-dimensional CAD model data;

a product manufacturing cost-estimation device that is connected to the three dimensional CAD unit;

wherein the product manufacturing cost-estimation device includes:

an estimation element database which stores necessary estimation elements for estimating of manufacturing cost of the product;

a manufacturing process design reference database which stores reference data setting a manufacturing process of the product;

an estimation reference database which stores both an estimation formula to calculate including a plurality of first estimation elements, expressed by four rule calculation operators and estimating a cost physical unit value in a the manufacturing process of a product, by substituting the estimation elements and a physical unit table of the cost physical unit indicating each value in each step of the manufacturing process of the estimation elements as a cost physical unit value;

an estimation-element-extracting section which extracts the attribute information added to the three-dimensional CAD model data of a product as second estimation elements;

an estimation element database which stores the second estimation elements extracted in the estimation element extracting section[[:]]

a manufacturing process setting section which sets the manufacturing process by searching the reference data for setting the manufacturing process stored in the manufacturing process design reference database; and

a cost physical unit value estimation section which obtains the cost physical unit value of the manufacturing process set by the manufacturing process setting section by calculating the estimation formula stored in the manufacturing process design reference database,

the cost physical unit value estimation section including a program auto-creating section which automatically converts a format of the estimation formula,

the program auto-creating section including:

a first source-program-creating section which creates a ~~plurality of~~ first source program ~~programs~~ configured to extract the ~~first~~ estimation elements from the estimation formula stored in the estimation reference database, and convert the extracted ~~first~~ estimation elements into a format ~~which can be executed by a preinstalled programming rule including an identifier and names of the estimation elements by referring to the second~~ searching the estimation elements stored in the estimation element database;

a second source-program-creating section which creates a second source program configured to extract the estimation elements from the estimation formula, convert the ~~first~~ estimation elements ~~which is extracted in the first source-program-creating section~~ and used to obtain a physical unit value from a physical unit table into the format which can be executed by the programming rule, and ~~extract the physical unit value~~ identifier from the physical unit table; and

a third source-program-creating section which executes ~~creates a third source~~ program ~~configured to convert the estimation formula into the format which can be executed by the programming rule, on the basis of the first and second source programs created in the first and second source-program-creating sections,~~ and converts the estimation formula into the format including the names of the estimation elements and the identifier[[:]].

~~a process the cost physical unit estimation processing section which substitutes calculating the cost physical unit value extracted from the physical unit table[[:]] by referring to the second estimation elements, for the estimation formula converted in the third source-program-creating section, executes the estimation formula, and estimates~~ substituting the cost

physical unit value in for the manufacturing process estimation formula converted in the third source-program-creating section.

Claim 19 (Canceled).

20. (Currently Amended) The product manufacturing cost-estimation apparatus according to claim 18, wherein:

in a bending process, the estimation formula includes bending-treatment time, a number of occasions and mold-changing unit time[[],];

the bending-treatment time including plate thickness, length and width[[],];

the mold-changing unit time ~~including~~ includes the plate thickness, length and width[[],];

the physical unit table ~~including~~ stores the plate thickness, length and width;

the first source-program-creating section creates the first source program configured to extract the plate thickness, the length, the width, the number of occasions and the mold-changing unit time ~~as the second estimation elements~~ from the estimation formula, converts the plate thickness, the length, the width, the number of occasions and the mold-changing unit time into formats each of which ~~can be executed by the programming rule~~ includes the names of estimation elements and the identifier;

the second source-program-creating section creates the second source program configured to convert the plate thickness, length and width of the mold-changing unit time corresponding to the plate thickness, length and width of the physical unit table included in the estimation formula into the formats each of which ~~can be executed by the programming rule~~ includes the names of estimation elements and the identifier; and

the third source-program-creating section executes ~~creates~~ the first and second ~~third~~ source programs created in the first and second source-program-creating sections, and converts ~~program configured to convert~~ the estimation formula including the names of estimation elements of the bending-treatment time, the number of occasions and the mold-changing unit time and the identifier ~~generated in the first and second source-program-creating sections into the formats each of which can be executed by the programming rule.~~